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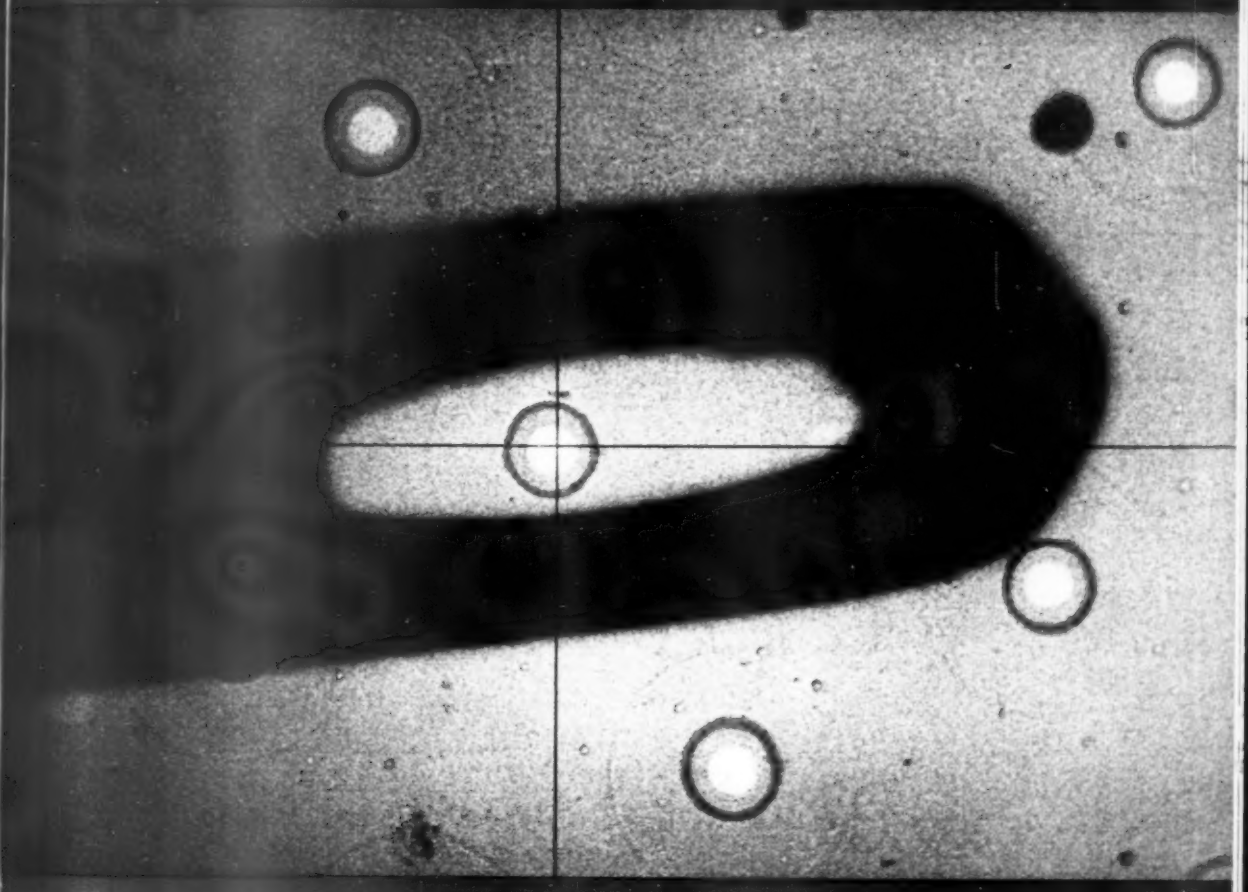

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SPACE

Fluorine for Rockets

The hazards of the most energetic of all rocket propellants have been overcome, leading to rockets with more lifting power for future space trips to the moon and planets.

▶ THE HAZARDS of using the most energetic of all rocket propellants, fluorine, have now been overcome, leading to rockets with more lifting power for trips to the moon and planets.

Fluorine when mixed with other elements becomes fluoride safe for water and toothpaste, but liquid fluorine is dangerous, hard to handle and must be kept at minus 306 degrees Fahrenheit.

The hazards of handling the propellant on the ground and its loading into the rocket have been solved, Harold Schmidt of Lewis Research Center told SCIENCE SERVICE in an interview.

He said the research with fluorine has also been successfully demonstrated in a practical prototype upper-stage engine. The hydrogen-fluorine combination is now as easy to handle as present combinations of propellants, including liquid oxygen and RP-1 (mainly kerosene) used in the Atlas rocket engines, the F-1 planned for the Nova moon rocket, and hydrogen-oxygen used in the Centaur rocket engine.

Fluorine could replace the oxygen in rocket upper stages as an oxidizer for the liquid fuel, such as hydrogen, increasing the payload in some cases 30% to 50%, he said.

This is because fluorine is more "energetic" than oxygen now used as an oxidizer to make the fuel burn. Therefore fluorine would need less space proportionally and smaller tanks would be needed.

Another advantage of fluorine is that no ignition system is needed to light the fuel as is necessary with oxygen. Fluorine is hypergolic, which means it burns spontaneously with the fuel. This in turn means that a fuel using fluorine can be restarted at will.

He said Lewis, a National Aeronautics and Space Administration research center, has worked with fluorine as an oxidizer for 12 years and explored it to the degree that the upper stage of a rocket could now be developed.

So far, the only solutions in sight for moon or planet flights have been either enormous rockets, difficult to handle, or several smaller rockets sent aloft separately and assembled in space for the long haul. The assembly or rendezvous technique has not even yet been explored.

Using fluorine for upper stages would mean smaller, more efficient rockets for moon and planet missions. It could also fuel the Centaur engine to go into the upper stages of the Saturn, which is scheduled to orbit a manned laboratory around the earth, or for the Atlas, which will orbit the first U. S. space man. In both cases modifications would have to be made, but the resulting systems would be capable of lifting greater payloads or carrying the same payloads farther.

He said the hydrogen-fluorine combination is the most advantageous for sending probes to the planet areas beyond Mars. With the boosters the United States will have during the next five years, greater payloads could be put into the major planet areas if the upper stages of the rockets are oxidized with fluorine.

To build the rocket stages with fluorine as a propellant would require the development of these upper stages since it has never been done before, he said. However, it would not be more costly than building any other new stage of a liquid rocket, and it would give space progress the "mostest with the quickest."

• Science News Letter, 80:331 November 18, 1961

SPACE

Testing Space Metals

▶ METALS for nuclear-powered spacecraft will soon be tested to see how they would stand up under the fierce radiation generated by the power source.

The tests will be the first of their kind ever made on different alloys of titanium, aluminum, and stainless steel at sub-freezing temperatures.

Patrick L. Donoughe, manager of the Plum Brook reactor, Sandusky, Ohio, told SCIENCE SERVICE that testing these metals will be the first experiment to be undertaken when the reactor goes to its full power of 60,000,000 watts.

He said the reactor, a facility of the National Aeronautics and Space Administration's Lewis Research Center, Cleveland, will provide a new tool for studying parts and materials under conditions similar to those anticipated in fully nuclear-powered systems for spacecraft.

Radiation from the reactor will be beamed at the metals at minus 430 degrees Fahrenheit to see if they would be suitable for storage tanks holding liquid hydrogen. Liquid hydrogen must be stored at minus 423 degrees Fahrenheit or less.

The hydrogen might be used as a propellant for spacecraft and kept in a tank close to the nuclear power source on board. It is not now known which metals would stand up under the simultaneous stress of the extremely low temperatures and the radiation from the power generator.

The tools needed for the testing are the reactor and a big refrigeration system, consisting of compressor units, expansion engines and heat exchangers to provide the needed low temperatures.

The reactor will build up power as soon as the Atomic Energy Commission inspects it during a shut-down period. It has recently "gone critical," generating more than enough neutrons to sustain the nuclear fission process. This marks the end of the reactor's test run since its completion last April.

Future experiments with the Plum Brook reactor could include the investigation of how much shielding is required to keep astronauts safe from nuclear radiation from a power source.

• Science News Letter, 80:331 November 18, 1961

SPACE

10,000 Tons of Dust Rain on Earth Daily

▶ SOME 10,000 TONS of dust rain down on earth daily, scientists report.

They base this figure on direct measurements of interplanetary dust particles made in the earth's vicinity from U. S. and Russian rockets, satellites and space probes.

The dust particles were measured from the noise they made when striking the space vehicles, Drs. C. W. McCracken, W. M. Alexander and M. Dubin of the National Aeronautics and Space Administration, Washington, D. C., report in Nature, 192:441, 1961.

• Science News Letter, 80:331 November 18, 1961

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SPACE

Second Ranger Readied

➤ THE SECOND spacecraft for moon and planet exploration is getting set for takeoff, the National Aeronautics and Space Administration reported in Washington, D. C.

The Ranger II is scheduled to go more than half a million miles into space before it returns and burns up in the earth's atmosphere. It will be a forerunner for other Ranger vehicles that will land an instrument capsule on the moon to investigate moon quakes.

These and later Rangers will also take TV pictures of the moon surface which are necessary before man can land on the moon.

The lunar surface is probably covered with dust. It also contains numerous cracks and fissures making a landing very dangerous without exact information about the surface features.

The Ranger II will not be "shot" at the moon, however. It will be sent on a long orbit into space for the preliminary testing needed before actual trips to the moon and planets. This includes an attitude stabilization system based on celestial reference (the sun and earth), an advanced communication system, the development of parts able to operate for long periods in space and the calibration of solar cells in a space environment.

Ranger II will, like its predecessor Ranger I, carry scientific experiments for studying cosmic rays, magnetic fields, space radiation and dust particles. It will also investigate a suspected comet-like tail of hydrogen gas believed trailing along with the earth.

The experiments were designed by scientists from the California Institute of Technology, Goddard Space Flight Center, Jet Propulsion Laboratory, Los Alamos Scientific Laboratory, Naval Research Laboratory, State University of Iowa, and the University of Chicago.

Ranger I was launched on Aug. 23 as the first of a series, but did not achieve its scheduled flight path. Instead it went into a low earth orbit between 105 and 312 miles above the earth. It stayed aloft only seven days, providing experimental data of the vehicle and many spacecraft subsystems.

The 675-pound Ranger II vehicle is slightly more than five feet in diameter at the base and 11 feet long. In space with its solar panels extended to collect energy from the sun, Ranger II is 17 feet in span and 13 feet long.

• Science News Letter, 80:332 November 18, 1961

SPACE

Space Animals Get Gray From Radiation of Cells

➤ AN EXPLANATION of why animals that go up in rockets sometimes develop gray hair was given on the basis of cell radiation. X-rays are responsible.

The irradiation is capable of killing or inactivating melanocytes, the cells in the skin that produce melanin (which includes a number of dark brown or black pigments).

But unexplained is the fact that gray-haired persons may begin producing dark hairs following exposure to X-rays. It was also found that gamma rays (similar to X-rays but carrying more energy) can tan the skin of mice.

Drs. Herman B. Chase, William E. Straille and Claudette Arsenault of Brown University, Providence, R. I., reported on the graying effect of X-rays to a New York Academy of Sciences conference in New York.

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ASTROPHYSICS

Endless Life Foreseen

➤ OTHER PLANETS capable of supporting life as earth does will occur endlessly in the future, a Nobel Prize winner believes.

Dr. P. A. M. Dirac of St. John's College, Cambridge, contends that habitable planets will continue to occur indefinitely and therefore the existence of life need never end. An opposing view is held by Dr. R. H. Dicke of Princeton University, Princeton, N.J., who believes that habitable planets exist in the universe only for a limited period of time. The scientists discuss their differences in Nature, 192:440, 1961.

Their differences are based on contrary interpretations of three numbers relating to the cosmos: the gravitational constant, a number determining the age of the universe (considered to be at least several billion years old) and the number of particles in the visible limits of the universe. These numbers are related in that the gravitational constant is roughly the reciprocal of the age of the universe, and the number of particles in the universe is roughly the square of the number determining the universe's age.

Nobelist Dirac believes that these relations are not by chance but correspond to something fundamental in nature. If the universe is now evolving, as many scientists believe, then the other two cosmological numbers are also changing as time passes.

Dr. Dicke, on the other hand, believes that there is a fundamental relation between the gravitational constant and the number of particles in the universe, but that the age of the universe is independent. Therefore the universe would have to be roughly at its present state of development for habitable planets to exist.

"There is no decisive argument for deciding between these assumptions," Nobelist Dirac said in commenting on Dr. Dicke's theories. However, he prefers the one that allows the possibility of endless life.

Dr. Dirac suggests that some day the question may be settled by direct observation. This would require measuring the gravitational constant to an accuracy of one part in ten billion, then repeating the measurement a few years later to see if there had been any change.

The numbers they use for the cosmological constants are: for the gravitational constant, five times ten raised to the minus 39th power, or 0.000,000,000,000,000,000,000,000,000,000,000,000,005; for the one determining the age of the universe, ten raised to the 42nd power, or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000; and for the mass of the universe, ten raised to the 40th power and squared.

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TECHNOLOGY

New Glass Film Technique Protects Tiny Diodes

See Front Cover

➤ A PROTECTIVE FILM of glass, only one ten-thousandth of an inch thick, can now seal microminiature diodes or transistors from moisture and other contaminants.

The diodes shown on the cover of this week's issue are on a greatly magnified portion of a small silicon wafer. The eye of a small sewing needle frames one of the diodes.

The Components Division of International Business Machines Corporation, Poughkeepsie, N. Y., developed the technique, using intense heat, more than 1,500 degrees Fahrenheit.

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ASTRONOMY

New Evidence Found Of Expanding Universe

➤ THE UNIVERSE is expanding, then collapsing again after a long time, evidence from photographs taken with the 200-inch telescope atop Mt. Palomar indicate.

Dr. William A. Baum of Mt. Wilson and Palomar Observatories, Pasadena, Calif., said that present-day observations are not compatible with a steady-state universe in which matter is continuously being created. The observations were made on very distant galaxies belonging to clusters of galaxies, he told the Royal Astronomical Society meeting in London.

The observations are based on the redshift of the light from these galaxies. This is the amount the light has shifted toward the red end of the spectrum. The redshifts are obtained by measuring each galaxy photoelectrically in six colors ranging from ultraviolet to infrared.

The largest red-shift so far observed indicates that the distant galaxy is receding at nearly 44% of the speed of the light, or at a speed of 81,840 miles a second. This cluster was found by Dr. Rudolph Minkowski of the University of California, Berkeley, to be in the position of a source emitting radio waves.

Dr. Fred Hoyle of Cambridge University, one of the proposers of the steady-state universe, pointed out that the problem of the age of the universe still remained. One difficulty, he said, is that the Milky Way galaxy, in which the earth and sun are located, is about ten billion years old, whereas the age of the galaxy with the greatest red-shift so far observed is about three billion years.

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ARCHITECTURE

"Hangar" Will Shelter Old Aircraft Collection

➤ LONDON'S Science Museum has provided suitable atmosphere in the form of a hangar-like structure on top of the main building, which is to be the new home of the museum's aeronautical collection.

Tubular steel arches carry the metal roof, made of aluminum inside and copper outside. At the places where the arches pass through the glass walls are bellows joints of copper designed to take up any expansion or contraction that might occur.

Among the famous aircraft to be shown will be a full-scale replica of the plane flown by the Wright Brothers at Kitty Hawk in 1903. The replica was presented to the British Museum when it returned the original Wright biplane to the Smithsonian Institution some years ago.

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MUSEUM "HANGAR"—This hangar-like structure on top of the Science Museum in London was built for the aeronautical collection.

MEDICINE

Use Cancer Drugs Sooner

➤ THE LIVES of thousands of cancer patients could be saved or prolonged if drug treatment, not pain-killers, were begun earlier, Dr. Sidney Farber of Harvard Medical School told SCIENCE SERVICE.

Summing up the current status of cancer treatment and the prospects ahead, Dr. Farber said it is doubtful whether more than 10,000 of the 260,000 patients who will die of cancer this year will have the benefit of cancer chemotherapy.

Instead of waiting until a patient is about to die or has an advanced state of cancer, Dr. Farber believes treatment with drugs should begin possibly even when the primary tumor is surgically removed.

Dr. Farber, speaking at the second conference on Experimental Clinical Cancer Chemotherapy in Washington, D.C., said "sufficient information is now at hand to permit research groups, particularly, to create programs designed to see if cancer metastases (spreading) can be prevented by adding chemotherapy" when the first tumor is removed.

Too many doctors, he said, believe that even when metastases have been demonstrated, it is best to wait until the patient "gets in trouble."

A team approach by the surgeon, the radiotherapist and the doctor who is an expert in chemotherapy would do much to increase the survival rate and total cure of those forms of cancer that are today affected by chemical agents, Dr. Farber said.

Cancer centers should be available in every large population center to help doctors care for their cancer patients, he said. Today there are 32 such centers in various parts of the country. One would be sufficient for the less-populated states, while cities like New York and Chicago would need several centers to provide information about the best modern treatment of cancer.

Three great directions of research are emerging that may eventually control cancer, Dr. Farber said. The largest is the search for drugs, the second is concerned with viruses and the third with immunology.

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MEDICINE

Army Advised to Cut Fats

➤ THERE IS A LIMIT to the Army traveling on its stomach. Too many soldiers are getting heart attacks, probably from eating a high fat diet, the Association of Military Surgeons was told in Washington, D. C. Changing the military diet to cut fat intake was recommended as a possible solution.

Atherosclerosis, a hardening of the arteries, is the leading cause of death from disease among active personnel in the U. S. Army. Although the link with high fat diet has not been proved conclusively, the evidence is condemning.

Recent surveys at four Army training camps showed that the actual total intake of food was well above the minimum daily recommended allowance. Fat made up more than 40% of the calories, and nearly half was "saturated." Saturated fat includes butter, whole milk, cream and conventional margarines. Beef, pork, solid shortening and chocolate are also on the list.

The recommendation to cut fat intake was made by Col. Weldon J. Walker, chief of the department of medicine's cardiology service, Walted Reed General Hospital, Washington. He is also a cardiology consultant to the U. S. Army Surgeon General. Collaborating on research was Lt. Col. Jacques L. Sherman Jr., medical research branch chief, U. S. Army Medical Research and Development Command, also in Washington.

The change in diet, which would make certain that dietary fat "does not exceed 35% of the total caloric intake" and that a greater proportion should be polyunsaturated fat, "is feasible without impairing the palatability of the diet."

"The desirability of the recommended change," Col. Walker said, "is supported by the best scientific information available at the present time."

Whether an Army diet of more fish, fowl, skim milk and certain margarines would actually result in longer lives awaits research.

It also would demand the cooperation of doting mothers and girl friends who add to the soldiers' quota of rich food by mail.

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Plastic Used for Burns

➤ MASS BURN casualties may in the future be treated temporarily with synthetic skin substitutes.

Synthetic skin is advantageous because great quantities, stored in sterile condition, can be applied as wound coverings, removed in stages and replaced later by successive skin grafts.

Dr. William M. Chardack of the Veterans Administration Hospital, Buffalo, N. Y., told the Association of Military Surgeons in Washington, D. C., that several children with more than 30% of their body covered with third-degree burns had been treated with good results using a plastic polymer.

Sheets of polyvinyl alcohol sponge as well as polyurethane foams of varying composition have been used. Studies of a number of spongy materials are planned to determine what is best.

The thickness of the synthetic skin sheet also needs further study before it can have widespread application.

Experience so far would indicate that a thin layer about one-seventh of an inch thick yields the best results, Dr. Chardack said. Heavier coverings apparently permit body fluid to accumulate in the pores not yet permeated by solid tissue, and could cause infection.

Dr. Chardack and his co-workers had previously experimented with animals. They found that the uniform flat layer of healing tissue remaining after the synthetic material was removed made an excellent surface for grafting material.

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Monkeys Made Neurotic

➤ MONKEYS with induced neuroses are among the unique medical research efforts in the Soviet Union reported by Dr. Joe M. Blumberg, Colonel, U. S. Marine Corps, at the Association of Military Surgeons meeting in Washington, D. C.

The purpose of the Russian experiment is to study the effects of these induced neuroses on coronary disease and arteriosclerosis.

To produce an experimental neurosis requires a high order of emotional stress, Dr. Blumberg said. Soviet scientists achieve this stress by having two males compete for a single female in a single cage. The result: three highly neurotic primates.

Soviet medical research also uses many mice and rats as experimental animals in exploring treatments for irradiation sickness. About 40% of animals exposed to lethal doses of radiation survived by being treated with acetylcholine and adrenalin.

A large part of the Soviet research observed by Dr. Blumberg is directed at the control of cancer. His impression was that the Soviets generally have an active and progressive medical program that has advanced a great deal in the last 20 years, but Soviet medicine still lags behind that of the West.

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MEDICINE

Pregnant Women Found Not Prone to Melanoma

➤ THE COMMON IDEA that pregnant women are more susceptible to a cancer generally originating in moles (melanoma) is not true.

In fact, Dr. Lauren P. White of the Children's Cancer Research Foundation, Boston, reported that women, in general, fare twice as well as men with the same illness.

When melanoma develops, the tumor usually begins in a brown or black mole, Dr. White said. But such a mole is not usually dangerous in itself, he explained. The average person will have many such pigmented moles that never become cancerous.

The darkening or freckling of the skin that may occur after exposure to ultraviolet rays is not usually harmful and neither is the pigmentation that sometimes accompanies pregnancy.

In fact, Dr. White believes, there is a natural human resistance to malignant growth in pigmented areas of the skin, although this resistance can be lost under certain circumstances.

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GEOLOGY

Warm Earth Man's Doing

▶ THE WORLD-WIDE warming of the earth's climate during the last 11,000 years was primarily caused by man.

The widespread use of fires coupled with an "exploding" human population resulted in large amounts of carbon dioxide being released into the atmosphere. The atmosphere, saturated with carbon dioxide, acted like a greenhouse by trapping the warmth of the sun's rays and started the warming trend evident today.

"The use of fire and cultivation of the soil by primitive man developed simultaneously," Dr. William Lee Stokes, University of Utah scientist at Salt Lake City, told the Geological Society of America meeting in Cincinnati. "Evidence indicates that primitive man set fires deliberately and made no efforts to put them out or keep them from spreading."

Disturbance of the organic-rich soil also accelerated the release of carbon dioxide into the air.

This "agricultural revolution" when man changed from hunter and scavenger to the tiller of the soil may have caused the warm trend, Dr. Stokes said. He noted that the population jumped from about five million to more than 86 million between 10,000 and 6,000 years ago.

Huge land areas in Europe, Africa and North America frequently burned out of control, releasing more carbon dioxide into the air.

Although many scientists have blamed the industrial revolution for the most recent warming of the earth's climate, the same arguments can also be applied to the older and larger climatic change, Dr. Stokes concluded.

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Beginning of Life

▶ PHOTOSYNTHESIS, one of life's basic processes, began more than 2.7 billion years ago in the primeval oceans.

The same process used by green plants to absorb carbon dioxide and give off oxygen was functioning in tiny algae-like substances known as stromatolites. These tiny algae, whose fossil records were left in the ancient rocks, were the forerunners of the complex plants abundant on the earth today.

Organic evolution, especially on land, was severely limited during the earth's early history by damaging ultraviolet radiation from the sun. The free oxygen necessary to sustain life built up gradually, aided by the photosynthetic action of millions of tiny organisms.

Growing evidence supports the idea that life on earth arose from the chemical evolution of non-living organic molecules with an assist from solar radiation, Dr. P. E. Cloud Jr., U.S. Geological Survey scientist, told the Geological Society of America meeting in Cincinnati.

Ancient seas once covered large portions of the cooling earth as much as 3.5 billion years ago. Rocks laid down by the seas in what is now Africa show that the earth had evolved sufficiently to condense enough water to form large bodies such as the present seas, Drs. William L. Donn of Brooklyn College and Lamont Geological Observatory, W. G. Valentine also of Brooklyn College, and Bertram Donn of the National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Md., reported.

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READING GLYPHS—Aubrey S. Trik, project architect for the Tikal, Guatemala, excavations of the University of Pennsylvania Museum, Philadelphia, measures a glyph in the "Tomb of the Painted Glyphs". Reading from top to bottom the Mayan date of the tomb 9,1,1,10,10,4, corresponds to the Christian date March 18, 457 A.D. Skeleton of a priest-ruler and the remains of two boys were also found in the tomb.

INVENTION

Better Explosive Method For Offshore Exploration

▶ AN IMPROVED method of exploring for oil in offshore areas without killing large numbers of fish won patent No. 3,006,279 for Robert W. Lawrence of Wilmington, Del.

The shock wave from dynamite exploded in water during seismic explorations can kill large numbers of fish, which is forbidden by fish and game authorities in some areas. Although firing black powder instead of dynamite reduces the fish kill, the seismic record obtained is not very satisfactory, Mr. Lawrence said.

He devised a detonating core and a sheath of relatively inert material to be used in offshore seismic explorations. Patent rights were assigned to the Hercules Powder Company, also of Wilmington.

Mr. Lawrence patented a core composition preferably consisting of from 50% to 95% ammonium nitrate and five percent to nine percent nitroglycerin. The sheath is also of ammonium nitrate but mixed with such carbon compounds as paraffin, coal or inorganic compounds such as sulfur or chalk.

A method and product for "improving the economic value of domestic animals" was awarded patent No. 3,006,810. Byron M. Shinn of Western Springs, Ill., and Emil Kaiser of Chicago assigned rights to Armour & Company, also of Chicago.

Estrogens have been used for many years to fatten livestock for market, either by implanting or by adding the chemicals to the animal feed. The drawback of using estrogens such as diethylstilbestrol is that all traces must be eliminated from the animal before human consumption.

To solve this problem, Mr. Shinn and Mr. Kaiser patented the use of estrogen derivatives, such as 4,4'-oxygenated stilbene compounds, to promote faster growth and increase weight in animals for food.

An aquarium filter for home use won patent No. 3,006,476 for Abby Halpert of Brooklyn, N. Y., who assigned rights to Halvin Products Co., also of Brooklyn. The filter attaches to the side of the aquarium, making it easier to remove for replacing the filter.

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PUBLIC HEALTH

Fear of Genetic Effects From Fallout Exaggerated

➤ THE GENETIC CONSEQUENCES of fallout from nuclear bomb-test explosions and the injury and damage that may result to unborn generations is of growing public concern.

"But these fears may be exaggerated," Dr. Richard Caldecott, geneticist of the U.S. Atomic Energy Commission, told SCIENCE SERVICE.

"In a long-term study made of a group of survivors of the Hiroshima and Nagasaki bombings and an unirradiated control group of the same age and physical characteristics and similar environment, there have been no more malformations in the progeny of the irradiated group than in those not exposed to the atomic bombs," he noted.

There are two possible reasons for this absence of detectable genetic effects, according to Dr. Caldecott. One is that the doses of radiation to which the survivors were subjected were so low as to result in imperceptible increases in genetic damage. The other is that many of the genetic changes that would be induced by irradiation could take several generations before they became detectable.

In other words, damage is more likely to be detected if both parents carry the same gene mutation. In any one generation, the probability of mating between those carrying the same genetic damage is relatively small.

"By far the most mutagenic agents known to man are chemicals, not radiation," Dr. Caldecott said. "And in this regard, food additives rather than fallout at present levels may present a greater danger."

The AEC geneticist emphasized that he in no way intends to give the impression that radiation exposure, even to the extremely small levels resulting from present fallout, might not have adverse consequences.

"However," he said, "it will be extremely difficult to pinpoint malformations in coming generations to fallout exposure at the present level."

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PUBLIC HEALTH

Strontium-90 in U.S. May Double Next Spring

➤ THE AMOUNT of cancer-causing strontium-90 on the ground in the United States may be doubled by next spring from the Russian bomb tests, Dr. Lester Machta of the U. S. Weather Bureau told SCIENCE SERVICE.

"In fact, by 1962 the strontium-90 fallout all over the Northern Hemisphere probably will have doubled as a result of the current series of Soviet tests and the exploded big bomb," he said. The fallout will be heaviest in the northern latitudes which include the United States, Canada, and northern Europe.

These estimates are based on the amount of fallout that resulted from the 1958 Russian atom bomb tests. About 90% came down the following spring. They are also based on Atomic Energy Commission calculations that place the fission yield from the 1958 Soviet bombs at about 50%.

Despite Soviet claims that the present series of bombs tested are "cleaner," there is, as yet, no evidence to show that their fissionable yield is less than 50%.

Despite the large increase in strontium-90 expected from the Soviet tests, experts in Washington still believe levels will be within recommended limits. However, in order to be able to counteract excessive contamination that may result, the National Advisory Committee on Radiation Safety, working with the Public Health Service, has set up three subcommittees: one on radiation surveillance, one on biological effects, and the third on control measures that may be applied to prevent the spread of radioactive contaminants from fallout.

Some of the control measures under consideration are liming the soil, diluting heavily contaminated milk and water with that from less-contaminated areas and stockpiling powdered milk. The United Kingdom has already begun stockpiling powdered milk.

Present levels of strontium-90 in food are well within the recommended limits, and there is no reason now to keep out of the diet milk or other calcium-rich foods that tend to absorb strontium-90, Public Health Service officials emphasized. Less than three percent of the strontium-90 from the present Russian tests has reached the earth so far.

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NATURAL RESOURCES

New Plant for Converting Salt Water to Fresh

➤ THE SECOND of five plants demonstrating how salt or brackish water can be turned into drinkable water was dedicated by Secretary of the Interior Stewart L. Udall at Webster, S. Dak.

The plant uses an electrodialysis process to reduce the salt content of local well water from about 1,800 dissolved parts of salt per million gallons of water to about 300 parts per million. It can produce 250,000 gallons of water per day, more than enough to meet the requirements of the Webster community, which has previously used brackish water.

The electrodialysis process uses the property of certain plastic membranes to pass only electrically positive particles and of other membranes to pass only electrically negative particles. When salts are dissolved in water, they break up into equal quantities of positively charged and negatively charged particles that will move in opposite directions in an electrical field.

The first saline water conversion demonstration plant was dedicated June 21 in Freeport, Texas. A third plant is nearing completion in San Diego, Calif. These, plus others being designed for Roswell, N.M., and Wrightsville Beach, N.C., will demonstrate the engineering, operating and economic potentials of the five most promising methods for converting sea or brackish water to potable water.

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IN SCIEN

GEOLOGY

Poles Have Shifted Thousands of Miles

➤ THE EARTH'S POLES have shifted thousands of miles throughout the earth's long history.

Scientists have now been able to trace the location of the North Pole about 600,000,000 years ago to the South Pacific. Since then, it has wandered throughout the Pacific Ocean, eventually reaching its present position.

The rivers of the world are the main reason causing the poles to shift. The spinning earth acting like a gyroscope shifts position when it becomes "top-heavy" in certain areas.

Rivers wearing down mountainous land transfer large masses of weight from one area to another. During a period of millions of years, the transplanted weight causes the poles to shift.

Periods of upheavals, erosion, and shifting poles have been continually recurring throughout the earth's history, Dr. George W. Bain, Amherst College geology professor, Amherst, Mass., told the Geological Society of America meeting in Cincinnati.

The process of erosion is now going on in southern Asia where the Indus, Ganges and other rivers are wearing away the Himalaya Mountains and dumping the load of sediments into the nearby seas. This shifting weight will eventually shift the North Pole deeper into Canadian territory bringing the cold Arctic weather to Montreal, Quebec and other Canadian cities.

However, it should cause no great concern in the immediate future for this will not happen for quite a few million years.

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TECHNOLOGY

Escalators in Canada For Shellfish Only

➤ SHELLFISH are crowding a water escalator in Canada, but they are not voluntary riders. The hydraulically operated escalators, under development by the Fisheries Research Board of Canada, recently demonstrated both efficiency and versatility as shellfish harvesters by bringing into boats such commercially important shellfish as soft-shell clams, bar clams, and oysters, 10 to 60 times as fast as a man with hand tools.

The harvesting equipment consists of a scoop that is forced along the sea bottom by the boat. In front of the scoop is a manifold with water jets to loosen the soil in which the shells are embedded. The conveyor behind the scoop rides the shells to the surface and into the boat.

The operation of the escalator harvester is limited only by water depths with depths of 10 to 12 feet about maximum.

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E FIELDS

MEDICINE

Germs Killed Quickly By New Penicillin

➤ A NEW SYNTHETIC penicillin kills "staph" germs about three times faster than local treatment such as hot soaks and drainage of the infected area.

In a study by researchers at the University of Cincinnati it was found that methicillin caused the infecting organism, *Staphylococcus aureus*, to drop off dramatically in an average of five days. It disappeared entirely in about eight days.

The drug was administered to 11 patients while 10 others received only local treatment. In patients receiving local treatment it took an average of 13 days for the organisms to decrease and about 23 days to wipe them out.

Drs. Rae E. Hartman, Alfred Lustberg and Morton Hamburger, with Judith Carleton, reported the findings at the First Interscience Conference on Antimicrobial Agents and Chemotherapy in New York.

New powerful antibiotics reportedly cured 80% of the staph-infected patients studied by Dr. N. Joel Ehrenkranz of the University of Miami School of Medicine, Coral Gables, Fla.

Dr. Ehrenkranz based his predictions of cure on the state of the patient's health at the time of his blood-stream infection with staphylococci. The majority of "fair risk cases" were cured.

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MEDICINE

Breast Enlargement Normal in Young Boys

➤ BREAST ENLARGEMENT in healthy, adolescent boys need not worry them or their parents, a report in the Journal of the American Medical Association, 178:449, 1961, says.

Such a condition, which has been found in 38.7% of a group of healthy, normal Boy Scouts, is no indication of femininity but is a temporary, harmless and normal phenomenon. Enlarged mammary glands will disappear within one or two years and no medical treatment is recommended by Drs. Martin Nydick, Jesus Bustos and Rulon W. Rawson of New York and John H. Dale Jr., Port Chester, N. Y., who made the three-year study of nearly 2,000 boys age 10 to 16.

A large program for sending American medical know-how to the whole world at a cost of a billion dollars during the next decade was recommended by Brig. Gen. James H. Forsee, U. S. Army Medical Research and Development Command, Washington, in a special communication to the A.M.A. He recommends a new foundation with private and Governmental support and an initial $100 million to be used in Latin America (p. 493).

More evidence that identical twins suffer from the same ills is presented by Drs. Lewis M. Schiffer, Matthew Zucker and Eugene L. Lozner of Syracuse, N. Y. Two 79-year-old women, proved by medical tests to be identical twins, suffered from six identical ailments, among them pernicious anemia, partial facial paralysis and benign breast tumor (p. 507).

The American Medical Association's Commission on the Cost of Medical Care has begun three new research projects aimed at developments in providing medical care, rate of recovery, prices and expenditures. Inquiries will be made in San Joaquin, Calif., Washington state and in various group program situations (p. 515).

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ORNITHOLOGY

Battle Still Going on To Save Whooping Cranes

➤ THE GOVERNMENT'S fight to preserve the whooping crane from extinction continues unabated even while the threat of man's extinction from a nuclear war looms large.

Ironically, *Homo sapiens* (man), the species that may destroy itself, is the same that almost killed off the whopping whoopers.

Early in the last century, there were thousands of the big birds. They pillaged corn and consequently were considered fair game by the early settlers and tillers of the soil. Their size, four feet tall with a seven-foot wingspan, and white color made them easy targets. By 1916 there were only 14 of the great cranes left, and man became concerned.

In 1938, the Federal Government, through the U.S. Fish and Wildlife Service of the Department of Interior, made a concerted, large-scale effort to protect the small flock. The efforts have paid off, and the flock of rare birds had increased to 36 at the last count in 1960. But only 30 of the 36 have returned to their winter quarters at the Aransas Wildlife Refuge in Texas this fall.

A search is now going on for the six missing birds, and there is a good chance that the stragglers may fly in from their spring quarters in Canada before severe weather sets in. However, the four baby cranes which Canadian watchers of the whoopers reported seeing at the Canadian nesting grounds this year have joined the 30 adult cranes.

Besides their threatened extinction, the cranes have other characteristics in common with *Homo sapiens*. They mate for life and the family group lives in relative privacy and harmony. The males dominate the flock and are the respective heads of their families. They are always willing to challenge real or imagined enemies while the females stay at home looking after the young.

Each year nature lovers and tourists in Texas spend $1,000,000 just for the privilege of peering at the cranes through a telescope mounted on a tower.

The birds get their name from their loud call which sounds like a horn and echoes a mile.

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TECHNOLOGY

Problem-Solving Machine Learns From Mistakes

➤ A LEARNING machine designed to tackle baffling problems that cannot be solved logically has been developed by Raytheon Company, Lexington, Mass.

Unlike computers, the Cybertron does not work from programmed step-by-step formulas, but attacks problems for which there are no known formulas. The machine learns by trial and error, relates new situations to past experience, and steadily improves its skill.

When the machine makes a mistake, a technician "punishes" it by pushing a "goof" button, forcing it to reconsider its decisions and modify its memory.

A small Cybertron, the K100, uses punched tapes for its learning processes and its memory storage. Used in a Department of Defense project on separating true target echoes from false radar signals, it came up with the necessary information for designing an improved filter capable of extracting more reliable information from radar equipment.

A larger model, the K200, will be able to recognize and type out typical English word sounds dictated to it. It is also being designed to squeeze spoken messages into tiny pulses that can be changed back into sound at the receiving end, multiplying by ten times the number of messages that can be sent simultaneously on one radio band.

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SPACE

Canadian Rockets Soon To Be Launched in U. S.

➤ A SERIES of Canadian rockets are scheduled to be launched at Wallops Island, Va., soon.

Scientists of the Canadian Defence Research Board will use the National Aeronautics and Space Administration's launching site because a fire largely destroyed the rocket range facilities at Fort Churchill, Manitoba, earlier this year.

Twelve Canadian Black Brants developed by the Canadian Defence Research Board for upper atmosphere research are scheduled for launching. The scientists hope, after completing these tests, to have a universal vehicle for scientific work—one that can carry a 150-pound payload 150 miles into space.

Two Black Brants are to be fired from Wallops Island in November, two more next February, six in April and two in May.

The Fort Churchill range for upper atmosphere research was built by the U. S. for use during the 1957-58 International Geophysical Year. Arrangements were subsequently made for joint Canada-United States operation.

The range will be redesigned and rebuilt at a cost of several million dollars. The U. S. will probably bear at least 90% of the cost. Range operations are expected to resume in late 1962 or early 1963.

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ASTRONOMY

Nature's Fireworks Probed

The secrets of auroras, or "northern lights," are being uncovered by satellites and human observers to learn how the earth and sun interact, Tove Neville reports.

➤ THE EXCITING SECRETS of nature's atomic fireworks, the shimmering "northern lights" that blaze across the skies at night, are now being uncovered by rocket probes and human observers.

These magnificent displays of red, green, blue and white light are often seen in the United States as luminous arcs across the northern sky, with rays beaming upward and bright "draperies" spreading to other parts of the sky.

The northern lights, or auroras, are sometimes seen as far south as San Francisco, Memphis and Atlanta, and have even been observed in Mexico City and Cuba. However, they are most likely to be seen at about the 53-degree latitude and most frequently in the middle of the night. The Southern Hemisphere also has its auroras, for the technicolor displays are associated with both the North and South Magnetic Poles.

The light in auroras is believed to be produced by streams of hydrogen ions, or protons, thrown off from the sun at speeds approaching 1,500 miles per second. These protons pull electrons with them and some eventually reach the earth, where its magnetic field separates the electrons and protons.

This produces one of the radiation belts that are detected close to earth. When some of the protons enter the earth's atmosphere, they cause the atmosphere to give off the light astronomers call auroras.

The auroras coincide with solar storms, or flares, which occur near the dark areas called sunspots. When there is little activity on the sun, only few auroras are seen. During times of great sunspot activity, auroras may occur night and day for long periods.

The sunspot cycle from one period of high activity to the next is about 11 years. Every time a period of high solar activity occurs, astronomers and geophysicists study the phenomenon of auroras, trying to confirm their theories or develop new ones.

The most recent intense study was made during the International Geophysical Year from July 1, 1957, to Dec. 31, 1958. Sixty-six countries gathered data about the various phenomena connected with solar activity, and satellite launchings were planned to probe the secrets of the sun and earth. Thus the IGY ushered in the space age.

Studies of the northern lights have been greatly aided by man-made equipment such as satellites, balloons, rockets, cameras, radar and special radio equipment. Information about how protons travel from the sun to the earth and form the radiation belt must be obtained by satellites.

So far the Injun and Explorer XII satellites have carried experiments for measuring protons, and another Injun is scheduled to be launched for further studies. Dr. James Van Allen of the State University of Iowa told SCIENCE SERVICE the experiments are designed to find out if the dumping of trapped particles in the auroral zones comes from the radiation belts already discovered or from separate radiation belts circling above the poles.

Drs. G. Sprague and Carl W. Gartlein of the IGY World Data Center A at Cornell University, Ithaca, N. Y., believe two such radiation belts are located 20,000 miles above each pole. They expect that auroras come down toward earth between these and the equatorial belts.

The scientists said it is known from studies of the light of auroras that the protons come in during the earlier part of an aurora and appear to be gone towards the end. The protons (cores of hydrogen atoms) produce the red and green light seen at the beginning of auroras. Drs. Sprague and Gartlein believe a "storage mechanism" forms nitrogen molecular bands that give off the blue light seen toward the end of auroras.

Although instruments show that the blue occurs late in auroras, only human observers using a blue filter can tell which forms have blue light in them because the eye is greatly superior to any detection system now known. Blue light may be seen in a wide glow or in patches. Blue light in the form of rays has been seen but the blue color is often difficult to see because it blends with the green light or is obscured by moonlight, which makes haze and mist also look blue.

Most of the information about auroras such as form, location, color and motion of the auroral formations comes from human observation. No computer or instrument is yet able to do the work of humans. A very fast TV tube can take an exposure of an aurora in about half a minute in one direction. This means that a TV picture of the whole sky requires about half a mile of graph paper.

Human observers are also invaluable because it would be extremely expensive to set up auroral tracking stations as close

ALASKAN AURORA—The break-up of an aurora in Alaska was photographed during a study by the National Bureau of Standards and the University of Alaska.

together as human observers. Therefore a program of visual auroral observations was made a part of the IGY, and the program is still in operation today.

Drs. Sprague and Gartlein, who correlate the material received from observers, have plotted more than 10,000 maps from the observations received during the 18 months of the IGY. Each map covers the time near an exact hour. From these maps the scientists have been able to determine the location of auroras for definite sizes of the magnetic storms of which they are a part. These are the most accurate descriptions of auroral location available anywhere in the world.

Beautiful and awesome as the northern lights may be, the magnetic storms associated with them are a major problem in world communication. Radio, radar, TV and transoceanic telephone connections often are partially or completely blacked out from these disturbances originating in huge solar flares shooting millions of miles into space from the sun.

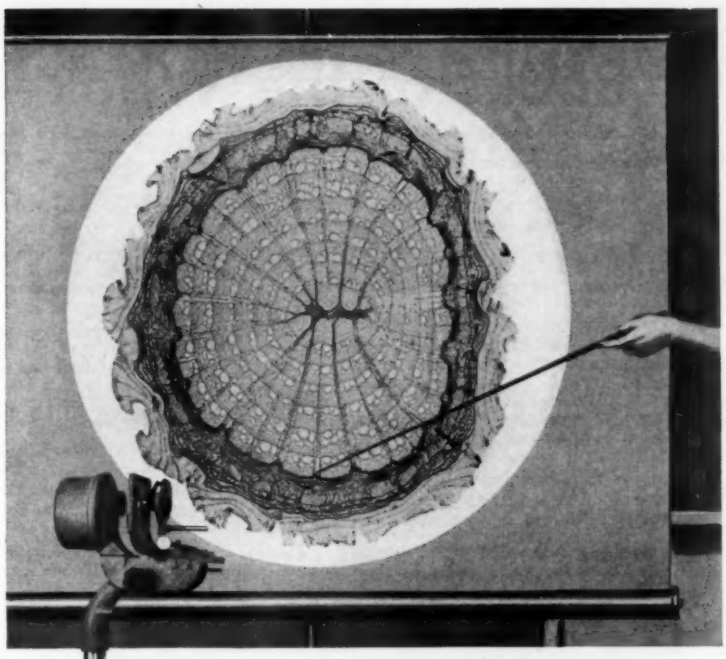
The disturbances are most severe in high latitudes near the Poles, but any detection system working at high frequencies is affected by a large solar storm. Satellites within 300 miles of the earth are also affected, since their orbital periods are reduced due to the expansion of the earth's atmosphere.

Observers of auroras can contribute important information by watching auroral effects on radio and TV. The IGY scientists report that even before an aurora begins, radio signals broadcast from the Ithaca station at 1620 kilocycles and from Washington, D. C. (WWV), at five megacycles become more difficult or impossible to receive, indicating an aurora is present. When neither station can be heard, the aurora is nearly overhead.

The scientists say information about such radio disturbances from observers may be the only warnings they have of auroras on cloudy nights or during the day when auroras cannot be seen. The interference operates on radio signals from the top of the AM dial, about 1400 kilocycles, to between two and 19 megacycles.

Magnetic disturbances occurring with auroras can also be detected at higher frequencies from 20 to 40 megacycles and on FM radio and TV signals. However, here the opposite effect occurs. Because such signals generally go in a straight line and so cannot travel beyond the horizon, they usually disappear after traveling a short distance. But when an aurora occurs, large numbers of electrons created in the atmosphere can reflect the signals from great distances, and stations unusually far off can be picked up. Signals from nearby stations during auroras are not so good, and black lines are seen on the TV screen when auroras occur.

Two types of auroras have been observed, one which does not move but stays in Canada and one which moves south and is associated with large magnetic storms. As the sunspot activity comes to a minimum in 1964-65, large auroras will become very rare.



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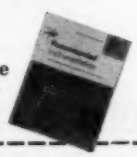

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BASIC RADIO, Vols. I to VI: DC Electricity, AC Electricity, Electron Tube Circuits, AM & FM Receivers, Transistors, Transmitters—M. Tepper—*Rider, J. F.*, 138 p., 138 p., 138 p., 122 p., 66 p., 154 p., illus., paper, $2.70 each; vol. V, Transistors, $1.90.

THE CONDENSED CHEMICAL DICTIONARY—Arthur and Elizabeth Rose, Eds., formerly directed by Francis M. Turner, 1889-1952—*Reinhold*, 6th ed., 1257 p., $17.50. Completely revised and enlarged chemical reference work, up-to-date names, uses, formulas, derivations, properties, information on chemicals, materials, trade synonyms and safety regulations.

THE CRAZY CANTILEVER AND OTHER SCIENCE EXPERIMENTS—Robert R. Kadesch—*Harper*, 175 p., photographs, diagrams, $3.95. Demonstrates for the young scientist 40 experiments using simple materials.

ELECTRONICS IN EVERYDAY THINGS—William C. Vergara—*Harper*, 235 p.. illus., $3.95. Answers general reader's questions about major applications of electronics.

EXPERIMENTS IN TRANSPORT PHENOMENA—E. J. Crosby—*Wiley*, 190 p., illus., paper, $3.95. Laboratory course to accompany theory of transport phenomena.

EXPLORING BY ASTRONAUT: The Story of Project Mercury—Franklyn M. Branley—*Crowell*, 104 p., illus. by H. K. Wimmer, $3.50. For young people.

THE FIRST BOOK OF THE HUMAN SENSES—Gene Liberty—*Watts, F.*, 64 p.. illus. by Robert Tidd, $1.95. For boys and girls.

FOKKER: The Man and the Aircraft—Henri Hegener—*Harborough (Aero Pubs.)*, 224 p., illus., $8.50. Biography of the famous Dutch aviation pioneer and aircraft manufacturer.

FOUR THOUSAND YEARS AGO: A World Panorama of Life in the Second Millenium B.C.—Geoffrey Bibby—*Knopf*, 430 p., illus., $6.95. Recreates the early civilizations of Egypt, Crete, Asia Minor, Mesopotamia and Europe.

THE GIANT SNAKES—Clifford H. Pope—*Knopf*, 310 p., photographs, $6.95. Comprehensive account of the boa constrictor, the anaconda and the largest pythons, for the general reader.

GRAND CANYON: Origin and Scenery. Also: GEOLOGIC MAP of the Bright Angel Quadrangle, Grand Canyon National Park, Ariz.—John H. Maxson—*GCNHA*, 31 p., illus., paper, 60¢, folded map in color, $1.25. For geologist as well as for layman.

INTRODUCTION TO FEEDBACK SYSTEMS—L. Dale Harris—*Wiley*, 363 p.. diagrams, $10.50. Basic principles of linear feedback systems with many work-book features.

INVITATION TO CHEMICAL RESEARCH—E. Emmet Reid—*Franklin Pub. Co.*, 366 p., $10.60. Research chemist's reminiscences and professional know-how, for chemistry students.

A MODERN INTRODUCTION TO ORGANIC CHEMISTRY—William B. Smith—*Merrill*, 266 p., illus., $6.25. Brief course of descriptive organic chemistry.

THE ORIENTATION OF ANIMALS: Kineses, Taxes and Compass Reactions—Gottfried S. Fraenkel and Donald L. Gunn—*Dover*, rev. ed., 376 p., illus., paper, $2. Expanded version of 1940 edition with supplementary biography.

THE ORIGINS OF SCIENTIFIC THOUGHT: From Anaximander to Proclus, 600 B.C. to 300 A.D.—Giorgio de Santillana — *Univ. of Chicago Press*, 320 p., illus., $5.95. Original interpretation of the great philosophical ideas of ancient Greece and Rome as the roots of what we have come to know as science.

OUR MODERN NAVY—Joseph L. Howard—*Van Nostrand*, 179 p., photographs, $5.95. Describes the aims, the vessels and weapons of the U.S. Navy in the space age.

THE PEACE CORPS: Who, How and Where—Charles E. Wingenbach, foreword by Sen. Hubert H. Humphrey—*Day*, 154 p., $3.50; paper, $1.95. About selection, training, work in the field and organization of the Peace Corps.

PREHISTORIC LIFE ON EARTH—Kai Petersen; Georg Zappler, Ed., foreword by Edwin H. Colbert—*Dutton*, 163 p., illus., $4.95. General principles and panoramic view of life as it evolved, for young people.

REPORT WRITER'S HANDBOOK—Charles E. Van Hagen—*Prentice-Hall*, 276 p., illus., $6.75. Discusses all phases of report preparation, for practicing scientists, engineers, and administrators.

REVISION OF THE UINTATHERES—Walter H. Wheeler—*Peabody Mus., Yale*, 93 p., 14 plates, paper, $2. Geographic and stratigraphic distribution, taxonomy and morphology of a group of fossil mammals, forebears of the rhinoceros.

(Continued on page 343)

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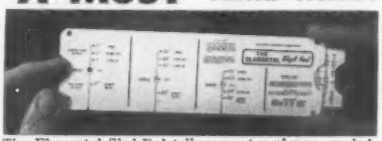

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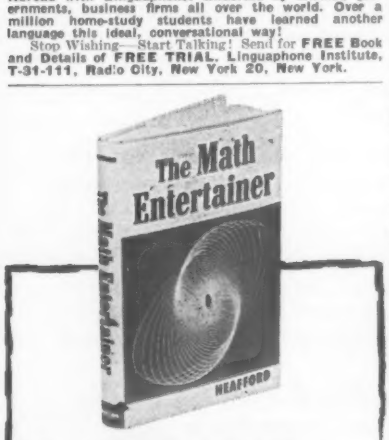

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VACUUM-CUP SOAP HOLDER is a thin flexible red, blue or green rubber disk with tiny vacuum cups on each surface. The cups secure the holder to the side of the sink or other convenient place and the wet soap is simply pressed against the holder where it will remain, even vertically.

• Science News Letter, 80:342 November 18, 1961

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• Science News Letter, 80:342 November 18, 1961

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• Science News Letter, 80:342 November 18, 1961

HOSE CLAMP TOOL for mechanics and repair shops consists of a small steel tube, 2¼ inches long and ⅜ inch in diameter, and a crank that is screwed into the threaded end of the tube. To use the tool, shown in the photograph, the ears of the

spring-type hose clamp are placed in the tube's 2¼-inch-long slot, and by turning the crank the ears are pushed apart, releasing the spring's grip around the hose. The hose can then be easily removed.

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PORTABLE SAW with an eight-inch blade is powered by a compact ¾-h.p. gas engine, thereby eliminating the electric cord. Weighing only 11 pounds, the saw can be operated in any position. A pull of the starting cord puts the saw into operation and it uses only a pint of fuel per hour.

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RADIOACTIVE SAMPLE PREPARATION KIT for nucleonics students is a quick, simple method for preparing uniform solid radioactive samples. A solution is filtered by suction through a chimney funnel. A dry uniform sample is deposited on a reusable porous stainless steel filter disc and the sample is then ready for counting.

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DISPOSABLE PILL CUP for hospitals is lightweight and inexpensive. The ¾-ounce transparent plastic cup has either a snap-in, pull tab paper lid, or one with an extension card for noting the patient's name and time for medication.

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• Science News Letter, 80:342 November 18, 1961

Nature Ramblings

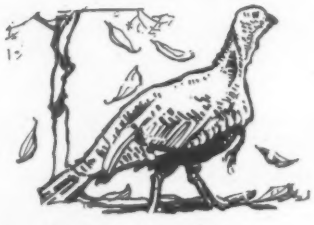
THE ANCESTOR of today's Thanksgiving table turkey was wild. When the first white settlers came to the New World, they discovered great flocks of these gleaming bronze birds. They roamed through the woods and swamps of eastern North America, feeding on acorns and other nuts.

The eastern wild turkey and its close relatives are native only to North and Central America. Because the turkey is a strictly American bird, Benjamin Franklin wanted it for our national emblem. When Congress was looking for an appropriate emblem for the Great Seal of the United States of America, Franklin proposed the turkey.

But after six years of deliberation, Congress chose the bald eagle. The bird was selected because for centuries it had been considered a symbol of power. The people of southern Mesopotamia had used the eagle as a standard since 3000 B.C. Later the Romans decorated standards with replicas of these birds. Congress adopted the bald eagle as the symbol for the Seal in 1782.

Franklin commented on the selection in

Wild Turkey



a letter dated Jan. 20, 1784:

"I wish," he wrote, "the Bald Eagle had not been chosen as the Representative of our country; he is a bird of bad moral Character; like those among Men who live by Sharping and Robbing, he is generally poor, and often very lousy.

"The Turkey is a much more respectable bird, and withal a true original native of America."

During the 1930's there were so few wild turkeys left in the United States it appeared as if the bird would become extinct.

• Science News Letter, 80:342 November 18, 1961

Do You Know?

Plastic *violins* rated better than moderate-cost wooden violins have been developed.

Multiplexing, a new system of broadcasting, enables FM radio stations to broadcast true stereophonic sound over frequencies they now use.

Some species of *butterflies* in Peru and Venezuela have hairs on the abdomen so venomous they cause an eczematous skin condition in humans on contact.

Bone fractures are more common in persons who live in single-level homes than in those who live in walk-up apartments that require more strenuous exercise.

Laying *hens* housed in floor pens with freedom to run about produce more eggs than those kept in cages.

Propetology, dealing with the individual's innate susceptibility and resistance to disease, has been reported as a new branch of medical science.

• Science News Letter, 80:342 November 18, 1961

Books of the Week

(Continued from p. 340)

ROCKETS AND YOUR FUTURE—Stanley Beitler—*Harper*, 141 p., illus., $3.50. Informs young people about the broad new field of space technology.

ROCKETS TO THE PLANETS—Erik Bergaust—*Putnam*, 48 p., illus., $2.50. Outline of planned and imagined space vehicles.

SCIENCE IN THE BATHTUB—Rebecca B. Marcus—*Watts, F.*, 24 p., illus. by Jo Polseno. $1.50. Factual reading for the very young.

SCIENCE IN THE GARDEN—Rebecca B. Marcus—*Watts, F.*, 24 p., illus. by Jo Polseno, $1.50. Information for the youngest readers.

SIMPLE SCIENCE EXPERIMENTS for Boys and Girls—Harold Visner and Adelaide Hechtlinger—*Franklin Pub. Co.*, 232 p., illus. by Norma Chigrinsky, $5. Procedure and explanation of 210 experiments for ages 9 to 12.

STANDARD REFRIGERATION AND AIR CONDITIONING QUESTIONS AND ANSWERS—Stephen Michael Elonka and Quaid Walton Minich—*McGraw*, 253 p., illus., $6.95. Handbook for plant maintenance.

THE STORY OF POLLINATION—B. J. D. Meeuse—*Ronald*, 243 p., illus. by Hilda Kern, $7.50. Botanist's readable account of the many ways in which nature attends to flower pollination.

THE STORY OF YOUR BRAIN AND NERVES—Edith Lucie Weart—*Coward-McCann*, 63 p., illus. by Alan Tompkins, $3. Clear and simple description of the intricate communications system of our bodies.

TAC: The Story of the Tactical Air Command—Leverett G. Richards, foreword by Gen. O. P. Weyland—*Day*, 254 p., $4.50. About the various divisions of TAC and the functions of its pilots.

• Science News Letter, 80:340 November 18, 1961

Questions

MEDICINE—How many cancer patients will probably receive the benefit of cancer chemotherapy this year? p. 334.

SPACE—What are the advantages of fluorine as a space propellant? p. 331.

Photographs: Cover, International Business Machines Corporation; p. 331, Minneapolis-Honeywell Regulator Co.; p. 333, F. C. Livingstone; p. 335, University of Pennsylvania; p. 338, National Bureau of Standards; p. 342, Borroughs Tool and Equipment Corp.

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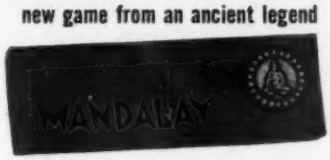

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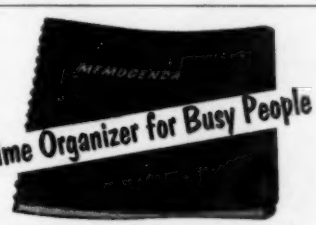

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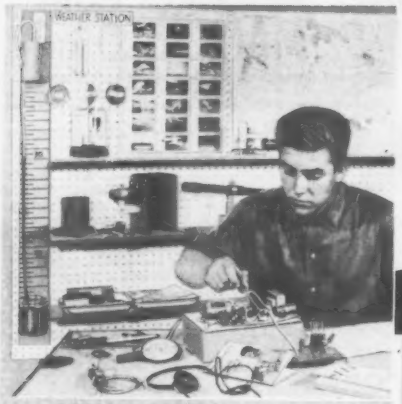

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